

Appendix J

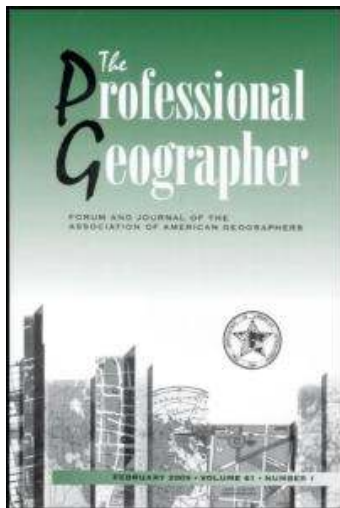
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Thomas A. Wikle^a; Jonathan C. Comer^a

^a Oklahoma State University,

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Barriers to Establishing Low-Power FM Radio in the United States

Thomas A. Wikle and Jonathan C. Comer

Oklahoma State University

Deregulation introduced by the 1996 Telecommunications Act brought unprecedented change to broadcasting, including the consolidation of independent radio stations within mega-networks. Acting in response to decreasing diversity in station ownership, the Federal Communications Commission (FCC) launched low-power FM (LPFM) radio in 2000. In the FCC's vision, thousands of community-based radio stations would serve local needs and increase diversity in programming and station ownership. However, despite its potential for serving urban minorities and improving connections between stations and local communities, fewer than 1,200 LPFM radio stations were established between February 2000 and July 2007. In this article we examine the distribution of LPFM stations, efforts by full-power broadcasters to limit LPFM expansion, and groups that have benefited most from the LPFM initiative. Our findings reveal that few LPFM stations have been established in densely populated urban areas that are subject to spectrum crowding. In lieu of helping inner-city minorities, the main beneficiaries of LPFM have been white Americans living in rural areas. Although civic and community organizations have been successful in establishing stations, the greatest number of LPFM stations are operated by religious organizations. This study can be viewed within a broader framework involving diverging interests of national corporations and small communities. **Key Words:** 1996 Telecommunications Act, localism, radio.

1996 年电信法所带来的放松管制对广播业带来了前所未有的变化，包括在大型广播网络内巩固独立广播电台的地位。作为对减少广播电台所有权多样性的响应，联邦通讯委员会（FCC）于 2000 年推出了低功耗调频（LPFM）电台。FCC 的设想是，数以千计的以社区为基础的广播电台将有助于服务当地的需要并增加广播节目和站台所有权的多样性。然而，尽管有其潜在的服务城市少数民族和改善站台和当地社区联系之利，自 2000 年 2 月至 2007 年 7 月，只有不到 1200 个 LPFM 广播电台得以建立。在本文中，我们研究了 LPFM 站台的分布，全功率广播电台限制 LPFM 扩张的努力，以及那些最能从 LPFM 获益的团体。我们的调查结果表明，受频谱拥挤的影响，只有少数的 LPFM 站是在人口密集的城市地区建立的。生活在农村地区的美国白人，替代了生活在城市的少数民族，变成了 LPFM 服务的主要受益者。虽然公民和社会组织成功地建立了许多电台，更多的 LPFM 电台是由宗教组织建立的。这项研究可以在一个更广泛的，涉及国家公司和小型社区不同利益的框架内加以检验。关键词：1996 年电信法，地方主义，广播电台。

La liberalización ordenada por la Ley de Telecomunicaciones de 1996 introdujo cambios sin precedentes a la radiodifusión, incluso la consolidación de estaciones de radio independientes dentro de mega-cadenas. Al actuar frente a la baja diversidad de propiedad de las estaciones, la Comisión Federal de Comunicaciones (FCC, por la sigla en inglés) empezó desde el 2000 a promover la radio FM de bajo poder (LPFM, *low power* FM). De acuerdo con la visión que tenía la FCC, miles de estaciones de radio comunitarias servirían las necesidades locales e incrementarían la variedad en programación y propiedad de las estaciones. No obstante, a pesar de su potencial de servicio para minorías urbanas y para mejorar las conexiones entre las estaciones y las comunidades locales, entre febrero del 2000 y julio del 2007 apenas se establecieron menos de 1.200 estaciones de radio LPFM. En este artículo examinamos la distribución de estaciones LPFM, los esfuerzos de radiodifusoras de pleno poder por limitar la expansión de las LPFM, y los grupos que más se han beneficiado

de la iniciativa LPFM. Nuestros descubrimientos indican que muy pocas estaciones LPFM fueron establecidas en las áreas urbanas densamente pobladas, sometidas a gran congestión del espectro. En vez de ayudar a las minorías del interior de las ciudades, los principales beneficiarios de las LPFM han sido los americanos blancos que viven en las áreas rurales. Si bien las organizaciones cívicas y comunitarias han tenido éxito en la fundación de estaciones, el mayor número de estaciones LPFM son operadas por organizaciones religiosas. Este estudio puede mirarse en un marco mucho más amplio que involucre los intereses divergentes de corporaciones nacionales y comunidades pequeñas. **Palabras clave:** Ley de Telecomunicaciones de 1996, localismo, radio.

Despite the emergence of advanced communications technologies such as satellite and Internet radio, terrestrial (AM/FM) radio has remained a popular source of information and entertainment. A 2006 survey found that nearly three quarters of persons in the United States listen to AM/FM broadcasts at least once a day (American Media Services 2006). However, unknown to most Americans, the relationship between stations and their listener communities experienced profound change beginning in the mid-1990s. The 1996 Telecommunications Act (Telecom Act) lifted regulations on radio broadcasting during a wave of deregulation impacting other industries such as air travel (Fairchild 1999). A key provision of the Telecom Act was the removal of most limits on broadcast station ownership leading to hundreds of independent stations, many minority owned, being purchased in massive consolidations. Within a short time, local programming was replaced with centrally controlled play lists, syndicated talk shows, and national news reports. Local stations that previously served community needs were subject to control by national corporations seeking to maximize profit margins.

In an effort to address declining numbers of minority-owned stations and losses in community-based programming, the Federal Communications Commission (FCC) created a new class of noncommercial radio in 2000 with power levels limiting reception to a few square miles. The FCC's vision for low-power FM (LPFM) radio was a licensing class that would create thousands of community-based radio stations serving local needs and increasing diversity in programming and station ownership (FCC 2000b). However, despite the potential for improving accessibility to broadcasting, relatively few LPFM stations have been established in urban areas. Through an analysis of station locations and the socioeconomic characteristics of potential listeners, this article identifies barriers to the establishment of

new LPFM stations and demonstrates that the LPFM initiative has fallen short of fulfilling its intended purpose.

Background

The Radio and Geographic Research

Terrestrial radio has retained its influence over the last eighty years because of its ubiquity and low cost. An inexpensive radio receiver provides nearly anyone with access to news, music, and other entertainment. In terms of serving listeners, radio stations operate within fixed geographic regions controlled by transmitter power, antenna height, local terrain, and competition from other stations on the same frequency.

Geographic research examining radio is relatively limited in scope. A few studies have looked at the distribution of radio stations (Innis 1954, 1972; Bell 1965; Doucet 1983; Greve 1996; Dimmick and Wang 2005), decentralization associated with broadcasting (Hägerstrand 1986), ethnic programming (Carlson 1997; Garner 2006), and radio's role in the context of other communications systems (Abler 1974; Hillis 1998). Studies have also examined the impact of radio on the formation of cultural boundaries (Morley and Robbins 1995; Hangen 2002). Research focused on LPFM is limited to Schiller's (2006) examination of community radio's role in the public sphere and Greve, Pozner, and Rao's (2006) investigation of LPFM and social movements. In the section that follows we briefly review the history of radio to provide a context for examining barriers to the establishment of LPFM in the United States.

A Look Back at Radio in the United States

Bekken (2000) identifies three categories of radio broadcasting that have evolved within the United States: commercial, public (government sponsored), and community. During the early 1920s, most radio stations were

operated by nonprofit entities such as religious organizations, labor unions, civic associations, and educational institutions. Financial support for commercial-free broadcasts came mostly from private donations or corporate sponsors (Mooney 2006). In 1923, 500 radio stations in the United States served approximately 1 million listeners and by 1926 nearly two thirds of American households had at least one radio receiver (Liebowitz 2004). In terms of its spatial diffusion, radio grew unevenly across the United States, beginning in large cities with high-power "clear channel" amplitude modulation (AM) station frequencies.

Because there were no established criteria for broadcasters, nearly anyone could operate a radio station in the early 1920s. As a result, competing transmitters clogged airwaves in urban areas, prompting calls for government oversight (Hilliard and Keith 2005). Regulation to prevent interference began in 1927 with passage of the Radio Act that charged the federal government with managing the frequency spectrum (Ruggiero 1999; Bagdikian 2004). An important stipulation of the Radio Act was that licenses were to be issued on the basis of serving the public interest. Between 1927 and 1934 the move toward commercial radio accelerated as station operators recognized the potential for generating advertising profits. Although some AM stations could be received in rural areas, especially at night, urban listeners were the primary target for most radio stations.

As commercial broadcasting was becoming the dominant force in radio, technological changes were taking place that greatly improved reception quality. Introduced in the mid-1930s, frequency modulation (FM) promised better reception over existing AM systems. In 1947 the growing popularity of FM prompted the federal government to move the band from 42 to 50 megahertz (MHz) to 88.1 to 108.1 MHz as a means of expanding the number of potential stations (Stavitsky, Avery, and Vanhala 2001). The automobile also played an important role in making FM profitable, as between 1970 and 1985 the number of cars sold with FM receivers increased from 14 percent to more than 85 percent (Morton 1999).

Despite the growing dominance of commercial radio, nonprofit groups including colleges, community organizations, and churches continued operating stations. Many smaller groups

benefited from the introduction of 10-watt Class D licenses, issued to civic and educational groups beginning in 1948 (Brand 2004).¹ However, despite their popularity, Class D licenses were phased out in 1978 under pressure from broadcasting organizations such as National Public Radio (Ruggiero 1999). Without a low-power license category, civic organizations and other nonprofit groups seeking entry into broadcasting had no choice other than to obtain a full-power license with its associated equipment costs, legal fees, and operating expenses. In the absence of legal alternatives, a growing number of groups and individuals established unlicensed "pirate radio" stations in defiance of FCC regulations. Pirate stations were known to their listeners for presenting activist political viewpoints and eclectic programming (Lewis 1984; Soley 1999; Brand 2004; Lucas 2006).

The total number of full-power radio stations continued increasing through the 1990s and by 2001 the number of radio stations in the United States reached 11,000 (Mooney 2006). However, few new stations were added in urban areas where the radio spectrum was already crowded. In 2001 the FCC received 30,000 inquiries about new station construction in urban areas but granted only six new licenses (Mooney 2006).

Radio Station Consolidation

Beginning in 1941, the FCC implemented policies such as the "local ownership" rule that restricted station ownership as a means of preventing monopolies, encouraging competition, and maintaining diversity in viewpoints presented to listeners (Arts Industries Policy Forum [AIPF] 2004). However, during the 1970s, media lobbyists began pushing for relaxation in ownership rules citing the benefits of market forces. The year before the Telecom Act was signed into law a company or individual could own forty radio stations nationwide and up to two AM and two FM stations in a single radio market area. The 1996 Telecom Act removed national ownership limits, increasing the number of stations that could be owned within a single market area to between five and eight, depending on the total number of stations in the market (Drushel 1998; Shaw 2001; Bednarski 2003).

Table 1 Number of stations owned by ten largest broadcasting networks, 2006

Owner	News stations	Total stations
Clear Channel Communications	136	1,190
Cumulus Broadcasting Inc.	33	303
Citadel Communications Corporation	24	225
Infinity Broadcasting	19	178
Educational Media Foundation	0	143
American Family Association Inc.	0	120
Salem Communications Corporation	22	104
Entercom	14	103
Saga Communications Inc.	13	86
Cox Broadcasting	6	78

Source: *The Project For Excellence in Journalism* (2006).

Despite its stated goal of increasing competition, the Telecom Act resulted in a significant decrease in competition (Lehman and Weisman 2000; McDowell 2000). In the first full year following passage, more than 20 percent of stations changed owners in a wave of consolidation (FCC 1997; Huntemann 1999). Compared to \$1.5 billion the year before, the value of station mergers in 1996–1997 exceeded \$13 billion, with a few large corporations such as Clear Channel Communications acquiring hundreds of independent stations (Table 1). By 2002, the ten largest radio conglomerates controlled two thirds of radio market share (AIPF 2004; DiCola 2006).

As noted by McChesney (2001), oligopoly that previously happened within the automobile and oil industries took hold of radio as media firms grew into national entities. Economies of scale resulted in surplus profits but also more limited consumer choices and barriers to competition (Warf 2003). At the same time, the rush to build networks pushed up the price of stations, making it increasingly difficult for minorities and women to enter full-power broadcasting (Aufderheide 1999; Bekken 2000).²

Station consolidation provides an example of the global versus local struggle observed by McDowell (2000) and others. In lieu of community-based programming, network-affiliated stations broadcasted syndicated talk programs and prerecorded national news (Hilliard and Keith 2005). In many cases the shifting emphasis away from local issues resulted in the downsizing or elimination of news staffs. Seeking to maximize profits, network stations also began focusing their

programming to appeal to wealthier listeners, leaving fewer stations offering programming popular among minority listeners (Ofori 1999; Berry and Waldfogel 2001; Chambers 2003; Warf 2003).³

Political Repercussions

In addition to changes in programming, station consolidation has generated concern over corporate control of entertainment and news. McChesney (2004) argues that corporate domination of the media can interfere with the democratic process. For example, the managers of networked media systems might be less willing to air programming that challenges the status quo or appears critical of issues important to national sponsors (Murdoch and Golding 1989; Herman and McChesney 1997). The consolidation of station ownership has also created situations where corporations use their influence over member stations to advance political agendas (McChesney 1999). Two of the largest radio networks, Clear Channel and Cumulus Media, have been accused of punishing musicians who actively campaigned against the Gulf War in Iraq by not playing their music (Jones 2003; Schwartz and Fabrikant 2003). Network control has also played a role in the expansion of conservative talk radio. In a 2007 survey, Halpin et al. (2007) found that among 257 news and talk stations owned by networks, 91 percent of their programming content was conservative.

The FCC's LPFM Rulemaking

The FCC's LPFM initiative was intended to increase the accessibility to broadcasting and improve diversity in station ownership and programming (FCC 2000a). A strong proponent of LPFM, FCC Chair William Kennard described the decision to create the new licensing category as having "thrown open the doors of opportunity to the smaller, community-oriented broadcaster" (FCC 2000c, 1). An important issue for Kennard and FCC members was the decline in African American station owners following passage of the Telecom Act (McChesney 2004). Unveiled in 1999, the FCC's Notice of Proposed Rulemaking outlined two types of LPFM licenses: LP100 and LP10. LP100 stations were limited

to 100 watts of power, creating a listener radius of approximately 3.5 miles from the transmitting antenna, whereas LP10 stations were capped at 10 watts with a radius of about 1.5 miles. The FCC's Notice noted that low power enabled dozens of LPFM stations operating on the same frequency to coexist within the coverage area of a single full-power station. Perhaps the most controversial aspect of the proposal was separating adjacent LPFM channels by only 200 kilohertz (KHz), creating the possibility of sixty-seven new channels (Orange 2001). This was a significant departure from the FCC's long-standing requirement of a 600 KHz separation (three channels) to prevent interference among full-power stations.⁴

LPFM licenses were restricted to noncommercial organizations such as schools, civic groups, non-English-speaking communities, public safety associations, and churches. LPFM brought advantages to these small organizations. Compared to the hundreds of thousands of dollars needed to establish a full-power station, an LPFM station could be set up for less than \$10,000. Lower costs meant that LPFM stations were affordable to a larger number of organizations. For example, an LPFM station could be used for local news and entertainment broadcasts to immigrant groups in their home language (Hazlett and Viani 2005).

Although the LPFM initiative provided incentives to small organizations, the establishment and maintenance of a station is a substantial undertaking. To ensure that stations remain local, the FCC requires LPFM licensees to reside in the community where the transmitting antenna is located. A single organization can own only one LPFM license and all stations are required to offer a minimum of eight hours of original programming each day. Because they are prohibited from generating revenue through advertisements, LPFM stations are dependent on volunteer labor and financial support from listener contributions.

Initial FCC estimates suggested that the LPFM initiative could lead to more than 100,000 new FM stations across the United States (FCC 2000b). As noted by Stavitsky, Avery, and Vanhala (2001), a wide range of parties lobbied in favor of the initiative, including the American Library Association, the National League of Cities, and novelist Kurt Vonnegut. However, the goal of reshaping

community radio was not universally welcomed. An FCC request for public comment issued in 1999 brought strong opposition from organizations representing full-power broadcasters such as the National Association of Broadcasters (NAB). Citing potential interference from low-power stations, National Public Radio (NPR) joined NAB in opposing the LPFM initiative (NPR 2000). However, as suggested by McChesney (2004), the NPR's opposition might have been more closely tied to the potential for competition from hundreds of new and independent stations.

In their arguments against LPFM, the NAB and its allies claimed that low-power signals on adjacent channels (within 200 KHz) would cause interference with full-power stations (Hamilton 2004). To address possible interference, the NAB lobbied Congress for legislation to enforce "third channel adjacency" on LPFM stations. Third channel adjacency prohibits a station from operating within two channels of a nearby full-power station. This means that if a full-power station is located nearby, an LPFM station can operate only as close as the third adjacent channel (600 KHz separation) if that channel is available. As shown in Figure 1, with 200 KHz separating adjacent channels, several LPFM stations transmitting on 90.5 MHz could operate within a twenty-mile radius of a full-power station transmitting on 90.3 MHz. To force compliance with third channel adjacency, NAB lobbyists and their Congressional partners inserted the rule as a rider on legislation passed by Congress in 2000. A year later, Congress passed the Radio Broadcasting Protection Act (RBPA), formally imposing third channel adjacency. As a concession to LPFM proponents, the bill included a provision for further study to determine the extent to which low-power stations operating within 200 KHz interfered with full-power stations. In 2003 the MITRE Corporation submitted its report on interference with a finding that LPFM transmissions caused no significant interference to full-power stations operating within 200 KHz (MITRE Corporation 2003; REC Network 2007). On the basis of the MITRE report, the FCC submitted a recommendation to Congress in 2004 for the elimination of third channel adjacency requirements for LPFM stations. However, Congress has yet to act on the FCC's recommendation.

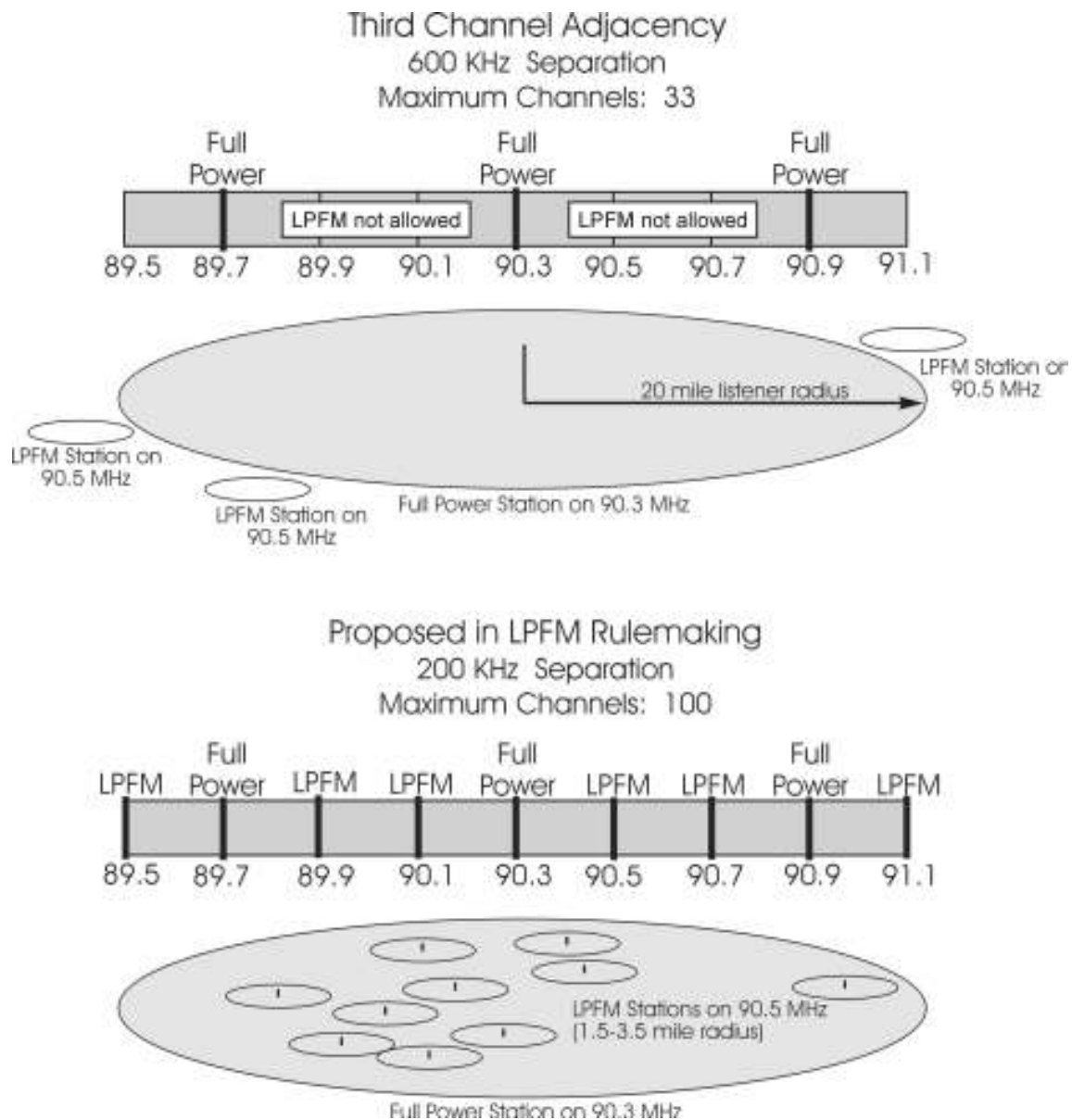


Figure 1 FM channel separation with and without third channel adjacency. LPFM = low-power FM.

Methods and Findings

As noted by Lucas (2006), instead of thousands of new community-based licenses forecasted by the FCC, the LPFM initiative resulted in just 1,200. Geographic information system (GIS) software is used to evaluate the influence of full-power station crowding on LPFM stations. An FCC database containing the locations of 9,169 full-power FM stations is used to examine station density. After plotting each full-power station's antenna location using latitude and longitude coordinates, a circular buffer with a twenty-mile radius is created around each station. It should be noted that the twenty-mile radius introduces a slight bias into

the results because radio signals travel farther over flat terrain or when taller antenna heights or higher power levels are used. However, the twenty-mile radius is determined to provide a representative area of reception for full-power stations. Subsequently, station competition is evaluated by identifying the number of full-power stations contained within each buffer. The number of other stations within each buffer ($N-1$) ranges from zero in less populated areas with a single full-power station to more than forty in large metropolitan areas.

With 600 KHz between channels, the FM spectrum (88.1–108.1 MHz) can accommodate thirty-three full-power channels. However,



Figure 2 Full-power station density and low-power FM (LPFM), United States, 2007.

optimal station placement is almost never realized in urban areas because transmitters are often positioned on tall buildings or mountaintops. Likewise, full-power stations are frequently more than 600 MHz apart on the FM dial, effectively reducing the potential number of channels.⁵ Given the limited range of the FM spectrum nationwide, it is important to note that the number of radio stations is a function of available radio spectrum rather than population density, meaning that new stations cannot be added in proportion to population growth or overall population size.

Figure 2 reveals the distribution of areas with the greatest amount of competition among full-power stations. Not surprisingly, areas having ten or more stations are located in large cities; a few large metropolitan areas such as Los Angeles, New York, Philadelphia, and St. Louis have more than twenty-six stations. By aggregating buffers into larger zones it is possible to determine the number of LPFM stations established at varying levels of competition with full-power stations. Figure 3 reveals that the largest number of LPFM stations has been established in areas with ten to fourteen full-power stations. It might be assumed that lower levels of competition from full-power stations would encourage LPFM stations.

However, most LPFM stations rely on listener support, making it difficult to establish stations in areas having low population densities, and with increasing numbers of full-power stations the number of LPFM stations also decreases. Third channel adjacency has made it difficult for new stations to be established in urban

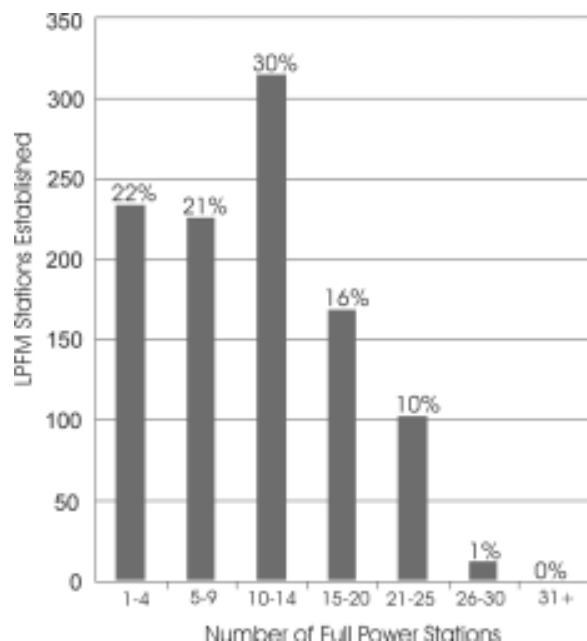


Figure 3 Low-power FM (LPFM) versus full-power FM stations, 2007.

Table 2 Comparison of block groups with and without low-power FM stations

Census variable	Area (mi. ²)	Density (persons/mi. ²)	Percent white	Percent black	Percent Hispanic	Percent Asian
LPFM	57.4	1,511	80.4	8.4	9.8	2.2
No LPFM	16.7	4,096	73.4	12.3	13.5	4.0
U.S. average	16.9	4,083	73.5	12.3	13.4	3.9

Note: LPFM = low-power FM.

areas. On a national level, fewer than 120 LPFM stations have been issued licenses in areas where there are more than twenty full-power stations.

Local and Regional Trends in LPFM

To evaluate local impacts of the LPFM initiative, 1,090 LPFM stations operating in July 2007 are evaluated with respect to their potential listeners.⁶ Although not an exact match in terms of shape, U.S. Census block groups provide the best proxy for representing socioeconomic characteristics of persons potentially impacted by LPFM stations. Of the 207,800 block groups used for the 2000 Census, 990 (0.47 percent) contain one or more LPFM stations. To evaluate impacts on listeners, socioeconomic characteristics of persons in block groups with LPFM stations are compared to persons in block groups without stations using 2006 population estimates (U.S. Census Bureau 2006).

A first comparison evaluates the basic characteristics of the block groups themselves. In terms of size and population, block groups with LPFM stations are over three times larger than those without stations but average only one third of the population density (Table 2). This suggests that, although stations do require a minimum population threshold to capture enough listeners to remain viable, LPFM stations tend to be located at the urban fringe in lower density areas. With respect to the race or ethnicity (percentage white, black, Asian, and Hispanic) of potential listeners, block groups with LPFM stations have lower percentages of black, Hispanic, and Asian persons, demonstrating that the principal beneficiaries of LPFM have been white persons, despite the stated goals of LPFM to increase diversity in radio station ownership.

To provide greater detail in evaluating how LPFM station types serve various population groups, socioeconomic characteristics of the 990 block groups with LPFM stations are analyzed with analysis of variance (ANOVA) across four author-defined programming categories: religious groups (e.g., individual churches, private religious schools, and radio ministries), civic and community organizations (e.g., ethnic minority channels, special interest groups), educational institutions (e.g., public secondary and higher education institutions), and government service organizations (e.g., local government, weather and road conditions). Stations are categorized based on background research with respect to the identity of their licensees, published mission statements, or both. ANOVA is used to identify differences in socioeconomic factors by comparing block groups within these four categories of LPFM stations to determine if the means are equal (Warner 2008). The results (Table 3) reveal higher percentages of whites, higher per capita incomes, and lower levels of poverty in block groups with religious stations (all significant to at least the 0.05 level). The situation is the opposite in block groups with educational stations, where median ages and per capita incomes are significantly lower with correspondingly higher percentages of households living in poverty, whereas community and civic stations are located in areas with significantly less white populations. These findings suggest that educational stations are more prevalent in younger and poorer areas that could benefit from educational programs and that community and civic stations are proportionately better represented in ethnically diverse locations.

ANOVA is also used to explore regional differences by comparing the socioeconomic milieu of station types within each of the nine

Table 3 Analysis of variance of socioeconomic variables, by station type, 2006–2007

Variable	Station type	<i>n</i>	<i>M</i>	<i>F</i> statistic	Significance
Median age	Religious	462	38.0	7.4	0.000
	Governmental	51	37.6		
	Educational	147	34.8		
	Civic	430	37.9		
	Total	1,090	37.5		
Per-capita income	Religious	462	20,173	3.9	0.009
	Governmental	51	18,647		
	Educational	147	17,368		
	Civic	430	19,460		
	Total	1,090	19,442		
Percent living in poverty	Religious	462	18.98	3.8	0.010
	Governmental	51	21.37		
	Educational	147	22.39		
	Civic	430	21.65		
	Total	1,090	20.60		
Percent male	Religious	462	48.98	3.2	0.022
	Governmental	51	50.38		
	Educational	147	48.69		
	Civic	430	49.54		
	Total	1,090	49.23		
Percent white	Religious	462	82.51	2.8	0.037
	Governmental	51	80.91		
	Educational	147	80.23		
	Civic	430	78.29		
	Total	1,090	80.54		
Percent black	Religious	462	7.31	2.3	0.081
	Governmental	51	5.89		
	Educational	147	9.23		
	Civic	430	10.04		
	Total	1,090	8.58		
Percent Hispanic	Religious	462	9.40	1.3	0.275
	Governmental	51	11.61		
	Educational	147	7.92		
	Civic	430	8.00		
	Total	1,090	8.75		
Population density	Religious	462	1,481	1.1	0.330
	Governmental	51	964		
	Educational	147	1,584		
	Civic	430	1,595		
	Total	1,090	1,516		

U.S. Census divisions. Given a somewhat greater degree of homogeneity within divisions as compared to Census regions or the nation as a whole, differences are generally less common or significant than in the national analysis given in Table 3, although there are some exceptions worth noting (statistical results are omitted for space considerations but are available from the authors). The most significant differences exist in per capita incomes in both the West North Central (significance level = 0.003) and West South Central (significance level = 0.008) divisions, with higher incomes in block groups with governmental and religious stations and lower incomes for educational and civic stations, mimicking the finding at the

national level. In the Middle Atlantic division, religious and governmental stations again rate significantly higher, although here in terms of the percentage of white residents (significance level = 0.008). Frequently, governmental and religious stations trend together in terms of socioeconomic traits, and generally there are higher incomes, lower poverty levels, and higher percentages of whites in block groups that have these two types of stations. Although educational and civic stations appear to be somewhat serving the targeted populations of the LPFM initiative, governmental stations are not and religious broadcasters have clearly found a niche that might not have been anticipated by the FCC.

Table 4 Cross-tabulation of low-power FM stations by type and census division

Census division (region)	Programming type				
	Religious	Governmental	Educational	Civic	Total
New England (Northeast)					
Observed count	14	3	7	26	50
Expected count	21.2	2.3	6.7	19.7	50.0
Standard residual	-1.6	0.4	0.1	1.4	
Middle Atlantic (Northeast)					
Observed count	22	5	6	23	56
Expected count	23.7	2.6	7.6	22.1	56.0
Standard residual	-0.4	1.5	-0.6	0.2	
East North Central (Midwest)					
Observed count	78	3	23	71	175
Expected count	74.2	8.2	23.6	69.0	175.0
Standard residual	0.4	-1.8	-0.1	0.2	
West North Central (Midwest)					
Observed count	43	4	16	18	81
Expected count	34.3	3.8	10.9	32.0	81.0
Standard residual	1.5	0.1	1.5	-2.5	
South Atlantic (South)					
Observed count	100	8	32	74	214
Expected count	90.7	10.0	28.9	84.4	214.0
Standard residual	1.0	-0.6	0.6	-1.1	
East South Central (South)					
Observed count	35	1	15	36	87
Expected count	36.9	4.1	11.7	34.3	87.0
Standard residual	-0.3	-1.5	1.0	0.3	
West South Central (South)					
Observed count	50	2	13	46	111
Expected count	47.0	5.2	15.0	43.8	111.0
Standard residual	0.4	-1.4	-0.5	0.3	
Mountain (West)					
Observed count	39	18	15	48	120
Expected count	50.9	5.6	16.2	47.3	120.0
Standard residual	-1.7	5.2	-0.3	0.1	
Pacific (West)					
Observed count	81	7	20	88	196
Expected count	83.1	9.2	26.4	77.3	196.0
Standard residual	-0.2	-0.7	-1.3	1.2	
Total					
Observed count	462	51	147	430	1090
Expected count	462.0	51.0	147.0	430.0	1090.0

Evidence of this assertion can be found in Table 4, in which stations are cross-tabulated by division and programming type. On a national basis, religious stations are most numerous, accounting for 42 percent of stations (462 out of 1,090), slightly ahead of civic and community stations (430 total). Educational stations lag far behind with only one third as many stations (147) as the former two types, and only a small number (51) of LPFM stations have been established by governmental entities such as traveler information stations operated by the Colorado Department of Transportation. Table 4 reveals trends that mirror national political and religious patterns. Religious stations are most numerous in four of the five divisions that comprise the Midwest and

South Census regions (and ranking second by just one station in the fifth division, East South Central), widely acknowledged as the more conservative "red state" areas of the United States today. In contrast, civic stations exceed religious stations in all four divisions that comprise the Northeast and West Census regions, the less conservative or "blue state" regions. The largest civic-to-religious station ratio is in New England (26:14), and the smallest is in the West North Central division (18:43), comprising the upper Plains states. Although it would be interesting to study various denominational patterns within the religious category, the data do not indicate denomination type and such analysis is beyond the scope of this article.

To assess the regional distribution of LPFM station types, the significance levels of the cross-tabulations shown in Table 4 are evaluated. A cross-tabulation statistical test compares observed frequency counts across two dimensions (here, Census divisions and programming types) to expected values that would result if there were no differences between categories across the two dimensions. Both the Pearson's chi-square test statistic (64.2) and the likelihood ratio (57.5) are significant to the 0.000 level (24 degrees of freedom for each test), indicating that station types are not distributed proportionally among regions. The largest deviations from expected counts can be identified by the magnitudes of the standardized residuals. Far and away the largest (positive) residual is for governmental stations in the Mountain division, likely due to Colorado's heavy use of LPFM for traveler information. The largest negative residual (−2.5) is for the West North Central division, already cited as having the smallest civic-to-religious station ratio (18:43) and consequently having a fairly large positive residual (1.5) in the religion column. Meanwhile, both the New England and Mountain divisions have large negative residuals (−1.6 and −1.7, respectively) for religious stations, indicating a much smaller than expected presence of religious stations in those areas.

Ultimately, these analyses in aggregate reveal that LPFM radio has not served minorities or disadvantaged populations to the extent envisioned by the FCC. Although religious stations tend to be located in areas that are more white and wealthy, very few significant differences in socioeconomic characteristics appear among the populations that are served by civic and community, educational, or governmental stations. In other words, these types of LPFM stations serve neighborhoods and communities that are fairly representative of the United States as a whole. Furthermore, there is a distinct regional flavor to LPFM, with religious stations prevailing in the South and Midwest, whereas civic and community stations are more common in the Northeast and West.

LPFM in Urban Areas

To provide greater detail about the extent to which LPFM stations have been established in

urban areas, station locations are investigated with respect to boundaries of 2000 Census Urban Areas (CUAs). The U.S. Census Bureau defines CUA boundaries using core block groups having population densities of at least 1,000 persons per square mile together with surrounding block groups with densities of at least 500 persons per square mile.⁷ CUAs are identified by the names of their largest cities.

Of 1,090 LPFM stations evaluated, 600 (55 percent) are located in CUAs. It is noteworthy that the remaining 45 percent of LPFM stations have been established in nonurban communities where population densities are relatively low; the influence of spectrum crowding in urban areas has pushed LPFM to the suburban fringe in many places. Of particular note is that, of 11,880 CUAs in the United States, only 438 (3.6 percent) contain an LPFM station. Table 5 shows that among the ten largest CUAs, LPFM stations were located in only the largest two, New York–Newark and Los Angeles–Long Beach–Santa Ana. A closer look reveals that the two stations within New York–Newark are located at the edge of the CUA, one serving the city of Ridge near the center of Long Island and the other Point Pleasant, New Jersey, far to the south of the metropolitan area. Likewise, the three stations in Los Angeles–Long Beach–Santa Ana are located on the boundary of the CUA within the wealthy Orange County suburbs of Newport Beach and Irvine. This highlights the impact of the third channel adjacency rule as a barrier to the establishment of LPFM in large urban areas. CUAs with the largest number of LPFM stations are also shown in Table 5. The twenty-sixth ranked Cincinnati CUA has the greatest number of LPFM stations with thirteen, followed by Madison, Wisconsin, with seven. Some relatively small urban areas have several LPFM stations, including Klamath Falls, Oregon, with four and Helena, Montana, with three.

Other Issues

In a few cases the FCC's efforts to increase local control over radio have created the opposite effect by helping some national organizations expand their geographic reach and influence. For example, Calvary Chapel, through its Calvary Satellite Network (CSN),

Table 5 Census urban areas and number of low-power FM stations, 2007

Rank	Census urban area name	LPFM stations	Full-power stations	2000 population
Ten largest urban areas in the United States				
1	New York–Newark, NY–NJ–CT	2	69	17,799,861
2	Los Angeles–Long Beach–Santa Ana, CA ^a	3	38	11,789,487
3	Chicago, IL–IN	0	62	8,307,904
4	Philadelphia, PA–NJ–DE–MD	0	44	5,149,079
5	Miami, FL	0	27	4,919,036
6	Dallas–Fort Worth–Arlington, TX ^a	0	25	4,145,659
7	Boston, MA–NH–RI	0	39	4,032,484
8	Washington, DC–VA–MD	0	21	3,933,920
9	Detroit, MI	0	30	3,903,377
10	Houston, TX ^a	0	24	3,822,509
Urban areas with the highest number of LPFM stations				
26	Cincinnati, OH–KY–IN	13	21	1,503,262
96	Madison, WI	7	5	329,533
284	Eau Claire, WI	6	3	91,393
34	Providence, RI–MA	6	13	1,174,548
85	Des Moines, IA	5	7	370,505
182	Gainesville, FL	5	3	159,508

Note: LPFM = low-power FM.

Sources: U.S. Census Bureau (2006) and Federal Communications Commission (2007).

^a Includes full-power stations adjacent to the census urban area boundary.

has created a national network of local church affiliates that rebroadcast packaged programming downloaded via satellite or the Internet (CSN International 2008; Sterling Communications 2008). CSN was able to attract new affiliate churches by offering station management workshops and assistance with the completion of the FCC's application form for establishing an LPFM station. Affiliate churches were offered access to up to sixteen hours of daily programming originating from CSN headquarters in Twin Falls, Idaho.⁸ By forming partnerships with local churches, CSN could distribute programming and gain influence without violating the FCC's requirement that LPFM stations be locally owned and managed. In addition to LPFM stations, CSN operates hundreds of remotely operated "translator" stations that use low-power transmitters to rebroadcast FM radio programming originating in Twin Falls.

Although full-power broadcasters have focused their objections to LPFM on the potential frequency interference, Hamilton (2004) suggests that they have other reasons to push for policies limiting LPFM expansion. LPFM threatens bandwidth that broadcasters view as crucial for the phasing in of advanced digital radio services. Digital radio, also called "band on channel digital audio broadcasting," currently provides text information about

stations and song titles on newer radio receivers and may eventually utilize channels adjacent to a station's primary audio frequency (200 KHz on either side) to display graphic images showing album covers, stock figures, or advertisements (File 2000; Parnis 2000). Competing with terrestrial radio are satellite radio systems like SiriusTM and XMTM that supplement audio broadcasts with digital text and real-time weather images. Available through subscription, satellite radio offers hundreds of channels featuring news and entertainment ranging from syndicated talk radio programs to college athletic events and urban jazz. Unfortunately for small communities, satellite radio's large coverage areas make it impractical for serving local needs.

With backing from LPFM proponents like the Prometheus Radio and the Media Access Project, as well as bipartisan Congressional support, the Local Community Radio Act (LCRA) was introduced in Congress in 2007.⁹ The key provision of LCRA is the elimination of third channel adjacency as recommended in the MITRE Report (Prometheus Radio 2007; Media Access Project 2008). LCRA acknowledges the importance of opening LPFM licenses to minority ownership as well as other benefits envisioned in the FCC's 1999 LPFM Rulemaking.

Conclusions

The 1996 Telecommunications Act restructured patterns of radio station ownership and, in doing so, changed the ways communities are served by local stations. Station consolidation enabled large corporations to increase the efficiency of local stations through economies of scale and national advertising campaigns. However, at the same time radio's long-standing role in providing a public service became overshadowed by a focus on corporate profits. Community-centered programming and local news have been replaced by packaged music, syndicated talk shows, and national news. Compared to locally owned stations, corporate networks have less tolerance for independent viewpoints that might offend sponsors. In some cases networks have imposed their own political agendas on affiliated stations. Consolidation has raised the price for entering radio broadcasting, creating barriers to station ownership among women and minorities. Since 1996, fewer stations offer ethnic programming as corporations direct their attention toward affluent listeners and mainstream American culture.

The FCC's low-power initiative offered the possibility of returning local voices to radio. By improving access to broadcasting the FCC hoped that LPFM would restore radio's close ties with communities and increase diversity in station ownership and programming. The initiative envisioned thousands of low-power stations operating in inner-city neighborhoods that would provide a range of services to ethnic groups and local communities. However, as we demonstrate, the ability of LPFM to serve these needs has been far from exceptional. Supported by most full-power broadcasters, the third channel adjacency rule excludes LPFM stations from large urban areas. In lieu of serving inner-city neighborhoods, LPFM has helped a disproportionate number of white, middle-class Americans through church-affiliated radio stations, many offering nonlocal content created by national organizations. Seven years after the first low-power licenses were issued, LPFM proponents, including community leaders and grassroots broadcasting organizations, have developed support needed to challenge national broadcasting groups through legislation such as the LCRA. The LPFM struggle illustrates

opposing interests of corporate America and community-based organizations where corporate influence over the political process and the goal of increasing profits has overshadowed the radio's traditional role in serving the public interest. ■

Notes

- ¹ Hilliard and Keith (2005) note that similar forms of low-power FM stations were established across European and Latin American countries in the 1980s and 1990s.
- ² The average cost of a radio station is now \$2.5 million. Although comprising 51 percent of the U.S. population, women own only 6 percent of full-power commercial radio stations. Likewise, ethnic minorities make up 33 percent of the U.S. population but account for only 7.7 percent of full-power radio stations' ownership. See http://www.stopbigmedia.com/files/off_the_dial.pdf (last accessed 7 July 2008).
- ³ The top radio formats among full-power stations are adult contemporary, top forty, oldies, news/talk/sports, and country. The number of stations offering ethnic programming is also declining as networks change formatting to attract more affluent listening audiences (Huntemann 1999).
- ⁴ The 600 KHz spacing policy was adopted by the FCC in 1963 when analog radios were tuned by moving the knob on a variable capacitor. Modern FM receivers utilize phase-lock loop and digital synthesis, enabling them to tolerate considerably closer channel spacing.
- ⁵ Spacing may be less in some areas because 400 full-power FM stations licensed before 1964 are not required to meet third channel adjacency requirements (FCC 2000a).
- ⁶ The database of operational LPFM stations was obtained from FCC records maintained at <http://www.fcc.gov/mb/audio/fmq.html> (last accessed 7 July 2008).
- ⁷ U.S. Census Bureau. http://www.census.gov/geo/www/ua/ua_2k.html (last accessed 7 July 2008).
- ⁸ LPFM stations may broadcast up to sixteen hours of content that is nonlocal.
- ⁹ A copy of the LCRA can be viewed at <http://thomas.loc.gov/cgi-bin/query/z?c110:H.R.2802> (last accessed 7 July 2008).

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- THOMAS A. WIKLE is a Professor in the Department of Geography at Oklahoma State University, Stillwater, OK 74078. E-mail: t.wikle@okstate.edu. His research interests include wireless communications and volunteer organizations.
- JONATHAN C. COMER is a Professor in the Department of Geography at Oklahoma State University, Stillwater, OK 74078. E-mail: jon.comer@okstate.edu. His research interests include wireless communications, rural transportation issues, and professional sport stadium location patterns.